



# *CONTROLLER MANUAL*

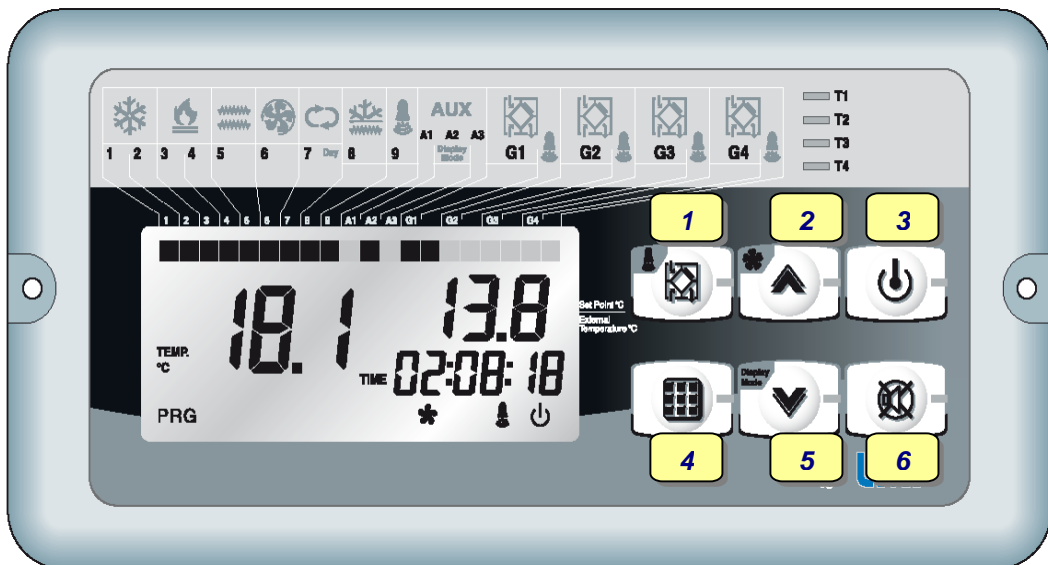
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*AIR-TO-AIR HEAT RECOVERY UNIT  
WITH BUILT-IN HEAT PUMP SYSTEM*

**SERIES** *RFM*

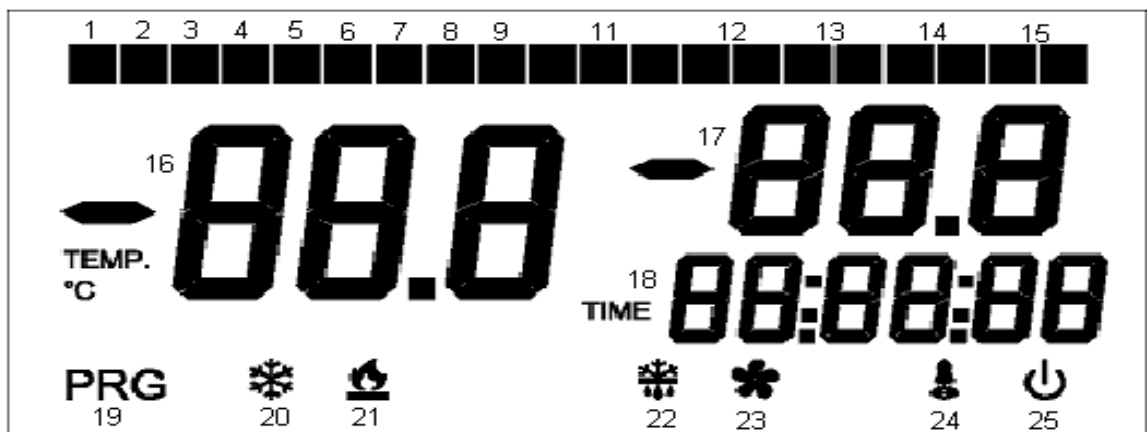
The RFM electronic control system is composed of the console and the power board, connected each other through a 4-pole screen electrical cable. The console, to be installed in a easily accessible place, lets the User input the control parameters by keyboarding the front keys. On a display each operation is visualized and confirmed; the power section, installed inside the electrical board, is an electronic component that controls the electrical outlets on the base of the parameters and configuration determined by the User. On the console, there are :

- the keyboard, for setting working parameter
- the display, for visualizing the set values, room temperature, system alarm code and compressor working timing
- the signalling leds, for visualizing system working mode (on-off, cooling, heating, free-cooling, defrost, alarm)



- Button 1 : master/slave selection
- Button 2 : value increasing and parameter list reading
- Button 3 : On/Off/Stand-by
- Button 4 : Set-point setting
- Button 5 : value reduction and parameter list reading and clock mode
- Button 6 : mute alarm

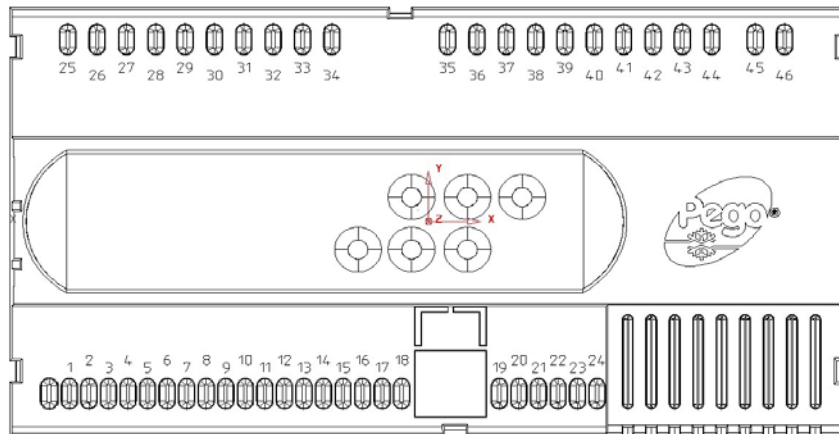
DISPLAYED FUNCTIONS



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1 Mode 2 : off; Mode 1 : Monday</li> <li>2 Mode 2 : off; Mode 1 : Wednesday</li> <li>3 Mode 2 : electric re-heater; Mode 1 : Friday</li> <li>4 Mode 2 : off; Mode 1 : Saturday</li> <li>5 Mode 2 : off; Mode 1 : Sunday</li> <li>6 Mode 2 : alarm</li> <br/> <li>12 Master condition : <ul style="list-style-type: none"> <li>a. Left light on = module existing but not visualized</li> <li>b. Left light flashing = module visualized</li> <li>c. Right light on = module on alarm mode</li> <li>Right light flashing = module on stand-by mode</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>7 Mode 2 : off; Mode 1 : Tuesday</li> <li>8 Mode 2 : off; Mode 1 : Thursday</li> <li>9 Mode 2 : off; Mode 1 : Saturday</li> <li>10 Mode 2 : electric heater (antifreeze mode)</li> <li>11 Light on = clock program on (mode 1)<br/>Light off = standard control on (mode 2)</li> </ul> |
|---|---|

- 13 Slave 1 mode : as above (both lights off = module absent)
- 14 Slave 2 mode : as above (both lights off = module absent)
- 15 Slave 3 mode : as above (both lights off = module absent)
- 16 Room temperature (Ta), flashing if the visualized module is on stand-by mode
- 17 Mode 2 : outside temperature (Te) of the visualized module; Mode 1 : set point
- 18 Clock visualization
- 19 Module on setting mode
- 20 Cooling working mode of the visualized module
- 21 Heating working mode of the visualized module
- 22 Defrost mode of the visualized module
- 23 Fan mode on of the visualized module
- 24 General alarm of any module
- 25 Light on = unit on; light flashing = unit on stand-by mode

**POWER BOARD (MASTER)**



**Input/Output list**

Terminals	Input	Output (free voltage contacts)
45-46	Power supply 230 Vac 50 Hz	
3-4	NTC 10K defrost sensor	
5-6	NTC 10K outside temperature sensor (Te)	
7-8	NTC 10K room temperature sensor (Ta)	
9-18	Compressor thermal protection	
9-17	Dirty filter alarm	
9-16	DDE inverter alarm	
9-12	Remote on/off signal (ON when open input, OFF when closed input)	
33-34		General alarm
35-36		Reversing valve
37-38		Electric heater (preheating/antifreeze mode)
37-40		Fan motors
41-42		Electric heater (heating mode)
43-44		Compressor

**Interfaces list**

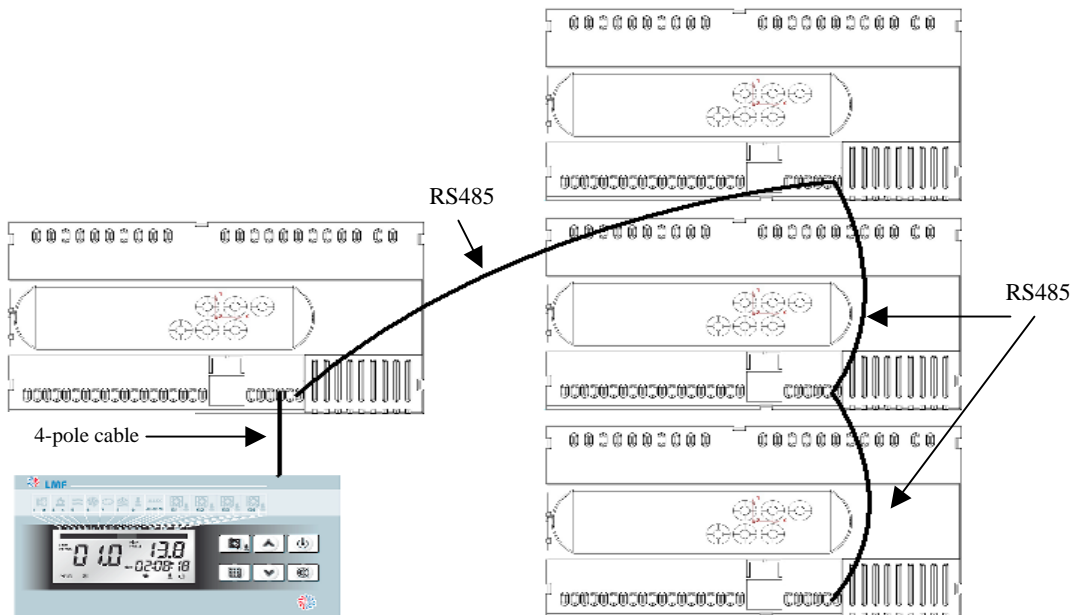
Terminals	Meaning
19-20	RS 485 serial link to RS 232/RS 485 serial converter as interface with BMS (communication protocol Modbus RTU)
21-22	RS 485 connection between master and slave units and connection with 4-pole consolle (connections : A↔22, B↔21)
23-24	Connection with 4-pole consolle (connections : "+"↔23, "-"↔24)

## Master-Slave module connection

By RS485 serial link between slave and master modules, it is possible to program up to 4 units with one console, connected to the master by 4-pole screen electrical cable, supplied with each unit. Each push on button 1 changes the slave module; this function is enabled when “nS” parameter isn’t zero.

With 10 and 11 digital inputs, the User can do the following master/slave configuration :

Master = clamps 9-10 open; 9-11 open  
Slave 1 = clamps 9-10 open; 9-11 closed  
Slave 2 = clamps 9-10 closed; 9-11 open  
Slave 3 = clamps 9-10 closed; 9-11 closed



## SETTING

### 1° LEVEL parameters

To modify the room set-point temperature ( $T_{sp}$ ), keep pushed the “Set key” while pushing (▲) or (▼) key, for increasing or reducing its value respectively.

To enter the variable configuration list, apply the following procedure :

1. push together the (▲) and (▼) keys for a few seconds till the label of first programming variable will appear on the display
2. free the (▲) and (▼) keys
3. select the variable to be modified by reading the variable list through with the (▲) or (▼) key
4. after selecting the interested variable, it will possible to visualize the setting while keeping pushed the “Set key” or to modify the setting while keeping pushed together the “Set key” and (▲) or (▼) key; when setting operation is finished, push together (▲) and (▼) keys to exit the list till room temperature value will be visualized
5. the record of variable modifies will be automatic after exiting the list

The selection of chronothermostatic (mode 1) or manual (mode 2) set-point control is done by button 5; the light n°11 on the display (see “DISPLAYED FUNCTIONS”) will show the selected control.

The following table represents the variable labels, their meaning, their value range and default value.

Parameter	Meaning	Range	Default value
r0	Main temperature differential	1 ÷ 4	2 [°C]
r1	Second temperature differential	1 ÷ 4	2 [°C]
tg	Set point for antifreeze mode by electric heater	-12 ÷ -1	-7 [°C]
tE	Fresh air temperature sensor (reading only)		[°C]
tEu	Defrost sensor (reading only)		[°C]
AC	DDE alarm digital input (0=open input : alarm mode, closed input : OK; 1=open input : OK, closed input : alarm mode)	0 ÷ 1	0
dy	Day of the week (1=Monday, ..., 7=Sunday)	1 ÷ 7	1
HMS	Clock set	00:00 ÷ 23:59	
t1	Set-point of the first timing of program P1	5 ÷ 35	18 [°C]
t2	Set-point of the second timing of program P1	5 ÷ 35	20 [°C]
t3	Set-point of program P2	5 ÷ 35	19 [°C]
tS1	Start time of the first timing of program P1	00:00 ÷ 23:59	07:00
tF1	End time of the first timing of program P1	00:00 ÷ 23:59	12:00
tS2	Start time of the second timing of program P1	00:00 ÷ 23:59	14:00
tF2	End time of the second timing of program P1	00:00 ÷ 23:59	18:00
tS3	Start time of program P2	00:00 ÷ 23:59	07:00
tF3	End time of program P2	00:00 ÷ 23:59	18:00
G1	Program set on Monday	P1 ÷ P4	P1
G2	Program set on Tuesday	P1 ÷ P4	P1
G3	Program set on Wednesday	P1 ÷ P4	P1
G4	Program set on Thursday	P1 ÷ P4	P1
G5	Program set on Friday	P1 ÷ P4	P1
G6	Program set on Saturday	P1 ÷ P4	P2
G7	Program set on Sunday	P1 ÷ P4	P4

Program	Working time [h]	Set [°C]
P1	tS1 up to tF1 tS2 up to tF2	t1 t2
P2	tS3 up to tF3	t3
P3	unit running all day long	setting by button 4
P4	unit off all day long	absent

## 2° LEVEL parameters

Accessible by pushing together buttons 2, 5 and 6 for a few seconds; the unit will be set in stand-by mode :

Parameter	Meaning	Range	Default value
d0	Defrost cycle delay time	00:01÷00:30	00:01 [min]
d1	Defrost cycle start set point	-20 ÷ +5	-5 [°C]
d2	Defrost cycle end set point	-20 ÷ +5	1 [°C]
d3	Defrost cycle max working time	1 ÷ 254	30 [min]
F5	Fan on delay after defrost cycle	1 ÷ 254	30 [s]
F1	Compressor minimum turning off time	1 ÷ 15	1 [min]
F2	Compressor minimum running time	1 ÷ 15	2 [min]
du	Heat pump on delay time	10 ÷ 20	15 [s]
q2	Working mode on sector II (0=fan only, 1=forced heating)	0 ÷ 1	0
q4	Working mode on sector IV (0=fan only, 1=forced cooling)	0 ÷ 1	0
nS	N° of slave modules connected to Master	0 ÷ 3	0
rEL	Software release (reading only)		

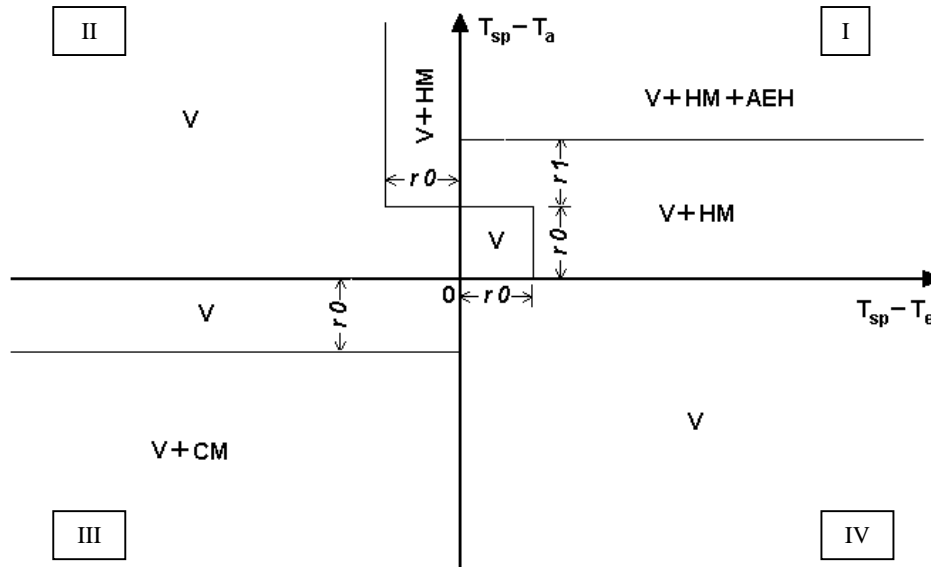
By reading through the list with button 2 or 5, the User can locate the interested parameter to be modified (or read); for its modification, while keeping the button 4 (calculator button) pushed, push the button 2 (for increasing value) or the button 5 (for reducing value).

The record of the setting will be by pushing together buttons 2 and 5 again for a few seconds; push button 3 to switch on the unit again.

## CONTROL LOGIC

The regulation of the unit is made on the base of the actual cross comparison between :

- set-point temperature  $T_{sp}$
- renewal air temperature  $T_e$  by NTC sensor positioned between crossflow heat recovery and summer evaporator
- room temperature  $T_a$  by NTC sensor positioned between return air filter and crossflow heat recovery



V = fan mode only  
 HM = heating mode  
 CM = cooling mode  
 AEH = electric heater mode (in addition to heat pump)

The working mode ranges shown in the regulation chart are set by the Manufacturer and unchangeable by the User.

### Defrost mode

According to the temperature value ( $T_f$ ) felt by NTC frost sensor positioned around the winter evaporator, the electronic control can put into action a defrost cycle, following the set parameters. In such condition, the electronic control makes the ventilation and 4-way valve off, transferring heat where needed.

## ALARM CONDITION MANAGEMENT

In case of anomalies, RFM control system informs the User via alarm code visualized on the display and a pip will be perceived. In case of an alarm condition, one of these messages will be visualized on the display :

Alarm code	Possible cause	What to do
E0	$T_a$ sensor failure	call Service
E2	EEPROM memory error (unit switched off, alarm kept on)	call Service
E3	Software incompatibility	call Service
En	Master-consolle connection missing	check the connection and restore
Ec	Wrong phase connection; compressor overload; too high or too low freon pressure	check the right main power supply connection by phase sequence relay; check compressor thermal protection; call Service in case of continuous pressure switch on/off
E5	$T_e$ sensor failure	call Service
E6	$T_f$ sensor failure	call Service
E7	Air filters dirty (signal from PSTD)	clean or replace air filters
E8	Inverter failure (signal from DDE)	change parameter AC; call Service if failure goes on
E9	Too cold fresh air	preheat the fresh air
Eb	Low battery	call Service